ENGINEERING.

A dispatch from the torpedo station at Newport speaks of the shortage of torpedoes in our navy as compared with that of other leading powers. The United States has on hand about 500 Whiteheads as against 4,000 credited to Germany, a similar number to Japan, and 10,000 to Great Britain.

The British battleship cruiser "Inflexible," which carries a battery of eight 12-inch guns, is said to have attained a speed of 27¼ knots during her recent trials, exceeding the trial record of the sister ship "Indomitable," which subsequently to her acceptance made the run across the Atlantic at a speed of slightly under 25 knots an hour. The Parsons turbine, with which the "Inflexible" and "Indomitable" are equipped, is certainly winning great distinction just now, both in the navy and the merchant marine.

Upon being shown a statement, made by Congressman Tawney before the Fire Underwriters' Association of the Northwest at a meeting in Chicago, to the effect that the Panama Canal would be completed in six years, at a total cost of $256,000,000, Col. Goethals, the chief engineer of the canal, who is at present in this city, verified the statement, asserting that he expected the canal to be open for navigation by January 1, 1915; and that unless some unforeseen contingency arose, the total cost would not exceed the sum named.

The omnipresent automobile was pressed into a new field of service the other day, when the printing plant of our esteemed contemporary, the Bloomfield Citizen, broke down, owing to the failure of the gasoline engine. The accident occurred during the running of the regular edition, and emergency repairs were out of the question. The timely arrival in his automobile of a friend of the editor solved the problem. The automobile was backed up to the rear door of the printing office, suitable connections were made from the engine to the cylinder press, and the edition came out only a few hours late.

Evidence of the severity of the present drought is shown by the conditions of navigation on the Ohio River, where there is not sufficient depth of water for the passage of light-draft vessels. It was officially reported at the beginning of the present month, that the water level at Cincinnati was only one foot above the lowest recorded stage, and that it was still falling on that date. On account of the low water, the United States Lighthouse Inspector has given orders that none of the river lights between Pittsburg and Chicago be lighted, something which has not occurred for a period of twelve years.

The new United States derelict destroyer "Seneca," which is receiving her finishing touches at the Newport News shipbuilding yard, will shortly be placed in service on the Atlantic coast, where she will keep the waters clear of derelicts from Bermuda to Sable Island. The headquarters of the "Seneca" will probably be at Tompkinsville, Staten Island. Arrangements will be made by which any incoming or outgoing ship, upon locating a derelict, may communicate the fact by wireless telegraphy. It is to be hoped that the success of this venture, concerning which there cannot be any doubt, will lead the other maritime nations of the world to build similar vessels for safeguarding those routes of travel which lie within their several jurisdictions.

The recent launch of the "Laurentic" by Harland & Wolff for the Liverpool-New York service of the White Star Line, was of more than ordinary interest to marine engineers, because of the fact that in this ship will be tried for the first time on a transatlantic liner, a combination of reciprocating and turbine engines. The ship is 565 feet in length and of 14,500 gross tons. Her motive power operates three propellers; two in the wings are driven by reciprocating engines, and one in the center by a turbine. The steam will be expanded down through the upper ranges in the reciprocating engines, and from them will exhaust at from 8 to 10 pounds pressure into the single low-pressure turbine, from which it will pass to the condenser. By this dual arrangement the maneuvering qualities of the reciprocating engine are combined with the steam economy of the turbine.

Apropos of our editorial in the issue of September 26 on the weight of passenger cars, a recent article in the Electrical Railway Journal on the same subject will be of interest. The data showing the relation of car weights to seating capacity include forty-six different cars, chiefly those designed for interurban service. Most of them weigh from 1,200 pounds to 1,333 pounds per seat, with a total seating capacity of from forty to seventy-one. The range of variation of weight is great. One interurban car seating sixty passengers weighed only 854 pounds per seat; another of the same capacity weighed 1,213 pounds per seat—a difference of dead weight per passenger of 42 per cent. The lightest car is a city box car weighing 625 pounds to the passenger, and the heaviest is a steel motor car weighing 1,600 pounds to the passenger, the latter seating sixty-four, and the former twenty-eight.

ELECTRICITY.

The total number of passengers carried by the railroads of New York State during the six months from July 1 to December 31, 1907, according to the Report of the Public Service Commission, was 1,630,775,156. Of this number steam roads carried 105,757,957. The rest were carried by electric elevated, surface, and underground lines.

A new electric locomotive is being used on the Puget Sound Electric Railway. It consists of a combination locomotive and flat car. The mechanism is placed under the floor of the car, leaving space for carrying rails, poles, and any apparatus that may be required in the repair of the track. The cab of the locomotive is placed in the center of the car and extends across the entire width. The cab is raised sufficiently so that the motorman may have a clear view of the track over the materials carried on the car.

It has often been observed that when looking at red and blue objects, the red one appears nearer than the blue. Writing in the current Quarterly of the United States Naval Institute, Dr. J. H. Clayborne calls attention to this phenomenon, and suggests that white electric lights be utilized for signaling on ships and lighthouses. The port and starboard sides of the ship could be differentiated by arranging the lights in different formations. Different lighthouses could be identified by the arrangements of their lights, and the size and shape of the arrangement would give more positive information as to the position of the lighthouse in respect to the danger point.

Wireless telegraphy as applied to military purposes has been tested at the maneuvers conducted at Atascadero, San Luis Obispo County, Cal., under Col. Marion T. Mans, U. S. A., commander of the Department of California. The signal corps was provided with portable instruments which were transported on the backs of mules, and they endeavored to keep in touch with the headquarters at the various distances across all conditions of country. The apparatus carried by the signal men operates inductively and requires no direct ground. It can be unpacked and set up in twenty minutes. The maximum range is 25 miles, but this can be increased by using a longer mast and a grounding system to 135 miles.

Shifting of trains is carried out with great simplicity by means of the new electric locomotive which has been installed for the purpose at Berlin in the Tempelhof yards. The locomotive is built specially for use in depots or locomotive yards and uses a storage battery, being thus quite independent. There are two electric motors, one on each axle, which give 20 horse-power each, or 40 horse-power for the entire locomotive. A potential of 300 volts is employed at the terminals of the battery, and there are 160 cells. During a series of practical tests which were made with the locomotive it was shown that the working speed was 7 feet per second, and the weight of the train varied up to 200 tons. The mean weight of the trains was 60 tons. The voltage of each cell is 2.45 volts at the charging and 2.09 volts on the discharge.

From time to time efforts have been made to use wireless telegraphy for distributing time signals from a central clock to the electrically controlled clocks over a wide area, but these efforts have been unsuccessful because of the disturbances due to other wireless systems, as well as atmospheric electric waves. However, an Austrian inventor appears to have solved the problem quite ingeniously. His central clock sends a signal only once every sixty seconds and the clocks to be controlled are provided with apparatus which will receive the Hertzian waves for that second only while for the remaining fifty-nine they are unaffected by any Hertzian waves. In case of a disturbance during the one second when they are in circuit with the receiver the disturbing wave may set the clock incorrectly and for the next minute it will be a fraction of a second fast or slow. However, this inaccuracy will be corrected by the master clock a minute later, when it is again placed in circuit with the receiving apparatus.

The maximum voltage of underground transmission systems has kept at about one-third that of overhead lines. The reason for this, and also the possible limitations for underground transmission, were discussed in a paper read before the American Institute of Electrical Engineers last week, by Messrs. P. Junkersfeld and E. O. Schweitzer. They sum up as follows: That underground cable systems of 11,000 volts and under if properly laid will give at least equal and probably more reliable service than most of the other elements of the system of which the cable is part. That where local and commercial conditions justify pressures as high as 25,000 volts, such a potential can safely be used for as much as 100 miles of cable, but that no single line of the system should be longer than 20 miles. On comparatively short lengths underground or underwater as a part of the overhead transmission line, cables operating at 40,000 volts can be used.

SCIENCE.

Prof. Edward Hull, F.R.S., whose studies of ancient river channels in the ocean bed have formed the subject of several interesting papers, has communicated to the Royal Geographical Society of Great Britain the results of his latest investigations in this field of research. By analyzing the Admiralty soundings he has succeeded in tracing the submarine bed of the River Adour and the Fosse de Cape Breton for a distance of about 50 miles out to sea, at which point it opens out on the floor of the ocean at a depth of 1,500 fathoms. He has also devoted considerable attention to the submerged valley of the Congo. Another scientist had previously traced this out from its upper limit, where it enters the Atlantic, to a distance of about 80 miles. Prof. Hull, however, has succeeded in carrying the channel a farther 20 miles out to sea.

Upon the new observations of Prof. Hale, made at Mount Wilson, Cal., on the double lines in sun-spot spectra, Prof. Zeeman bases a theory that sun spots are strong magnetic fields. The source of light in a magnetic field emits two rays circularly polarized in opposite directions and parallel to the lines of magnetic force, according to Prof. Zeeman's experiments. The sun-spot lines photographed by Prof. Hale are identical in character with these lines. Hence Prof. Zeeman's conclusion. To produce the actual phenomena observed on the sun would require a current of about 5,000 amperes. The theory throws a great light upon meteorological and terrestrial magnetic phenomena, affording, as it does, some reason for the perturbations observed in the electric and magnetic equilibrium of our earth and its atmosphere. In order to account for the force which converts a sun spot into a magnetic field, Prof. Hale assumes a segregation of positively or negatively electrified particles caught in the stream of a solar vortex, so as to give rise to lines of magnetic force at right angles to the plane of the swirl.

The question, can fish distinguish colors, has often been asked, but has never been very satisfactorily answered. Dr. David Starr Jordan, president of the Stanford University, states that it has been assumed that fishes can distinguish colors to some extent, but the only basis of that supposition has been the fact that the fishes in their breeding season are often brightly colored, and that males and females are often of very different colors. Two sets of experiments have recently shown that fishes can distinguish colors; one of these experiments was made at the University of Michigan, and showed that with the "rainbow darter," a brilliantly-hued little fish of the Michigan brooks, the bright-colored males with blue and red frighten the younger males by the display of these colors. It has also shown that the young males colored like the females are not distinguished by the full-grown males from these, so that the sexes seemingly know each other by the brilliant colors of the full-grown male. Another set of experiments are those of Prof. Jacob Reighard, also of the University of Michigan. In the tropics he has taken the "silver side," and painted it different colors, and he finds that the predaceous barracuda sees certain colors much more readily than others, and quickly snaps at objects that are brightly colored. The prevailing silver-green colors of the living fish are best adapted to escape the attention of the larger fish, and thus, to some extent, their wearers enjoy an immunity from destruction.

A Javanese subscriber of this journal, Mr. Bruysman of Nongho Djadjar, near Lawang, Java, sends us an interesting communication on a botanical garden which he established in 1907 at an altitude of 4,000 feet. The climate, he writes, is ideal. Even the wet season lasting from November to April is not too unpleasant despite the daily rains. The temperature is fairly constant, fluctuating from 65 deg. in the morning to 80 deg. at midday. Water is plentiful even in the dry season because of the innumerable mountain springs. In his experimental botanical garden Mr. Bruysman is growing hundreds of tropical, European, Asiatic, American, and Australian plants, his purpose being to collect medicinal, ornamental, and useful plants from all quarters of the globe. In attaining that purpose he has been assisted by many botanists, and asks that the readers of this journal help him in his work by sending seeds and specimens. He finds that many European plants flourish better in his garden than in their native habitat. During the rainy season (a very critical period for any botanical experiment of such magnitude) he carries on by far the greater number of his studies, because plants which resist its heavy moisture may be regarded as acclimated. It is impossible to mention in a brief note all the plants he has studied or to condense in a few lines the results of his elaborate experiments. Suffice it to say that his plants include most of the commoner forms known to Europe and America. Mr. Bruysman writes that he will be glad to furnish gratuitously seeds or roots of medicinal plants in his garden for purposes of experiment to readers of the SCIENTIFIC AMERICAN.